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Aerial Application of Antimycin: A Fish Toxicant

William R. Selbig
Area Fish Manager

ABSTRACT

Past use of liquid antimycin with fixed-wing aircraft has demonstrated that excessive misting is caused due to high air speeds. The misting affects evaporation of the carrier acetone, causing the residual toxicant to float on the water surface.

Helicopters can successfully deliver antimycin because of their slower air speeds and maneuverability. Antimycin formulations that can be applied by helicopter include sand and liquid types. Helicopter equipment that can be used to apply antimycin is basically the same as used in commercial spraying operations.

When liquid antimycin is used it is essential to remove the orifice and spinner gear that is contained in the spray nozzles. Correct air speeds and spray boom pressure settings are also very important when spraying liquid antimycin. Helicopters can distribute antimycin granules by several different methods.

Slower air speeds, maneuverability and ability to use varied equipment are some factors that make the helicopter a successful aerial vehicle to apply antimycin.

AERIAL APPLICATION OF ANTIMYCIN: A FISH TOXICANT

Introduction

Fish toxicants of various formulations have been applied by a wide spectrum of devices since the first professional use in the 1930's. In the last decade, aircraft have become increasingly popular as a method of application, since it permits a savings in manpower and time and makes the treatment of large inaccessible waters possible. The toxicants toxaphene and rotenone have seen extensive use nationwide, both by ground application and aerially. Due to its persistent nature, toxaphene is seldom used. Rotenone is the most commonly used toxicant at present and has been applied aerially with a great deal of success.

Antimycin (tradename Fintrol) was first registered in the United States and Canada in 1966 and has experienced a growing popularity due to its rapid degradation, nonrepellency and choice of formulations (Lennon et al., 1970). Aerial application of antimycin was initially used on a large scale in 1968. Fixed-wing aircraft was employed and the toxicant was ejected under 60-80 P.S.I., at relatively fast air speeds. It was learned that the carrier (acetone) evaporated before the antimycin reached the water, causing the toxicant to float due to surface tension and density difference. Since 1968 helicopters have successfully been used to distribute liquid and sand formulations of antimycin.

Large treatment projects pose a wide variety of water habitat situations and the helicopter equipment and formulation used is determined by the habitat target area. By using the proper equipment and formulations virtually any lake or stream can be aerially treated. Additional experience will broaden the techniques available and new approaches will be developed.

Antimycin Formulations

The three current formulations of antimycin available are: antimycin coated on sand grains, a liquid concentrate and a cake formulation. The Fintrol-bar (cake formulation) is intended for stream treatment.

There are three types of the sand formulation, Fintrol-5, Fintrol-15, and Fintrol-30. They are designed to release the toxicant in zero to 5, 15 or 30-foot intervals.

Fintrol concentrate when properly mixed with a dilutent is readily soluble in water and is used in stream or aerial situations. All types of the sand formulation and the liquid concentrate can be successfully applied via helicopters.

Aerial Equipment

There is a wide variety of equipment that can be used on helicopters to apply chemicals. In general, equipment used for commercial agricultural spraying can be used for application of fish toxicants with little or no manipulation. The two categories of applicators used on helicopters are remoted buckets and spray booms.

The remote bucket is suspended from the underside of the helicopter from a sling, 6 to 20 feet in length (Figure 1). The pilot controls toxicant release remotely. Granular or liquid formulations may be used in the remote bucket.

A helicopter rigged for remote bucket application has the capability of transferring from liquid antimycin treatment to sand application in a matter of minutes. This capability poses both a physical and financial advantage. Physical in that only one helicopter and less manpower and equipment is necessary, and financial because of fewer helicopters and a resultant smaller rental fee.

FIGURE 1

A remote sand bucket suspended from a jet turbine Bell Model 206 helicopter.

Due to the size and weight of a remote bucket, a jet turbine helicopter is usually necessary to develop the necessary lift capabilities.

A remote bucket rigged for granular application consists of a hopper, spreader and power source. The granules are stored in the hopper and mixed at a ratio of 10 parts nontoxic sand to 1 part Fintrol-5. A nontoxic sand of a similar size granule is used; Fintrol sand formulations can seldom be applied aerially at the low parts per billion scale needed. From the hopper the granules are routed through a control box that is adjusted to deliver a specific quantity of sand per unit or time (or surface area). From the control box granules enter a power spreader device that functions as an agent to establish a uniform swath upon exist.

The sand formulations of Fintrol must be mixed with the nontoxic sand prior to entering the hopper of the remote bucket. Many different approaches can be used to mix the granules, but a conventional cement mixed mounted on the bed of a truck works well. A tractor with a front-end loader transports the sand from the cement mixer to the bucket hopper (Figure 2).

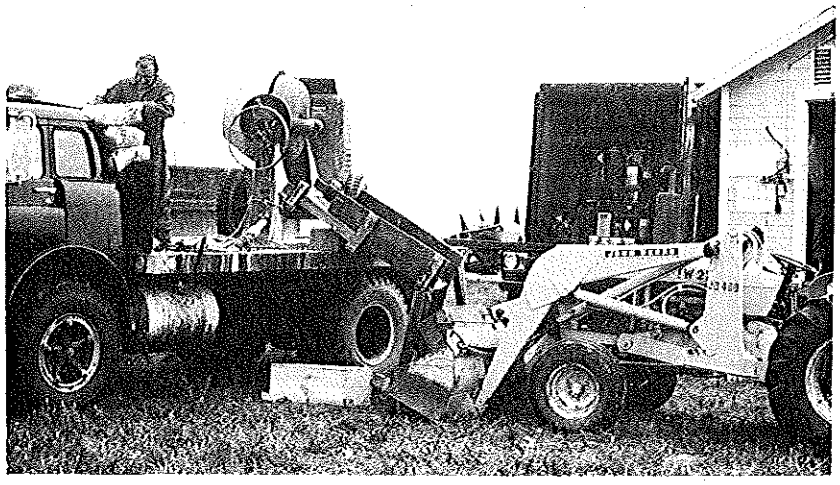


Figure 2. Mixing nontoxic sand with Fintrol formulations to be transferred to helicopter.

The remote bucket can normally handle 600 pounds of granules. The useful load of either sand or liquid is determined on the site by the helicopter pilot. The useful load includes pilot weight, fuel on board, weight of attached equipment, plus the weight of the load to be delivered.

Temperature and pressure altitude also affects the maximum gross weight of a helicopter and should be considered when computing load maximum under certain conditions. Table 1 illustrates how pressure altitude and temperature will affect the maximum gross weight of the jet turbine Bell Model 206.

Climatic conditions and pressure altitude are seldom as extreme as indicated in Table 1, yet it is important to note that lift capabilities of helicopters are affected by weather conditions.

May helicopters use side-mounted tanks for granular applications which operate on the same principle as a remote bucket.

A novel method of distributing granular Fintrol is simply a hand dump while the aircraft hovers. The hand dump technique requires no special equipment and can be extremely effective. The best situation for use of the hand dump technique is a number of relatively small ponds or ditches, particularly those that may have difficult land access. When the aircraft hovers over the target area, the sand formulation is poured from the can over the water. If an elevation of approximately 40 feet is maintained, the granules are uniformly dispersed by wind turbulence of the helicopter rotors. Both pilot and passenger must use caution and west safety goggles and protective gloves and clothing.

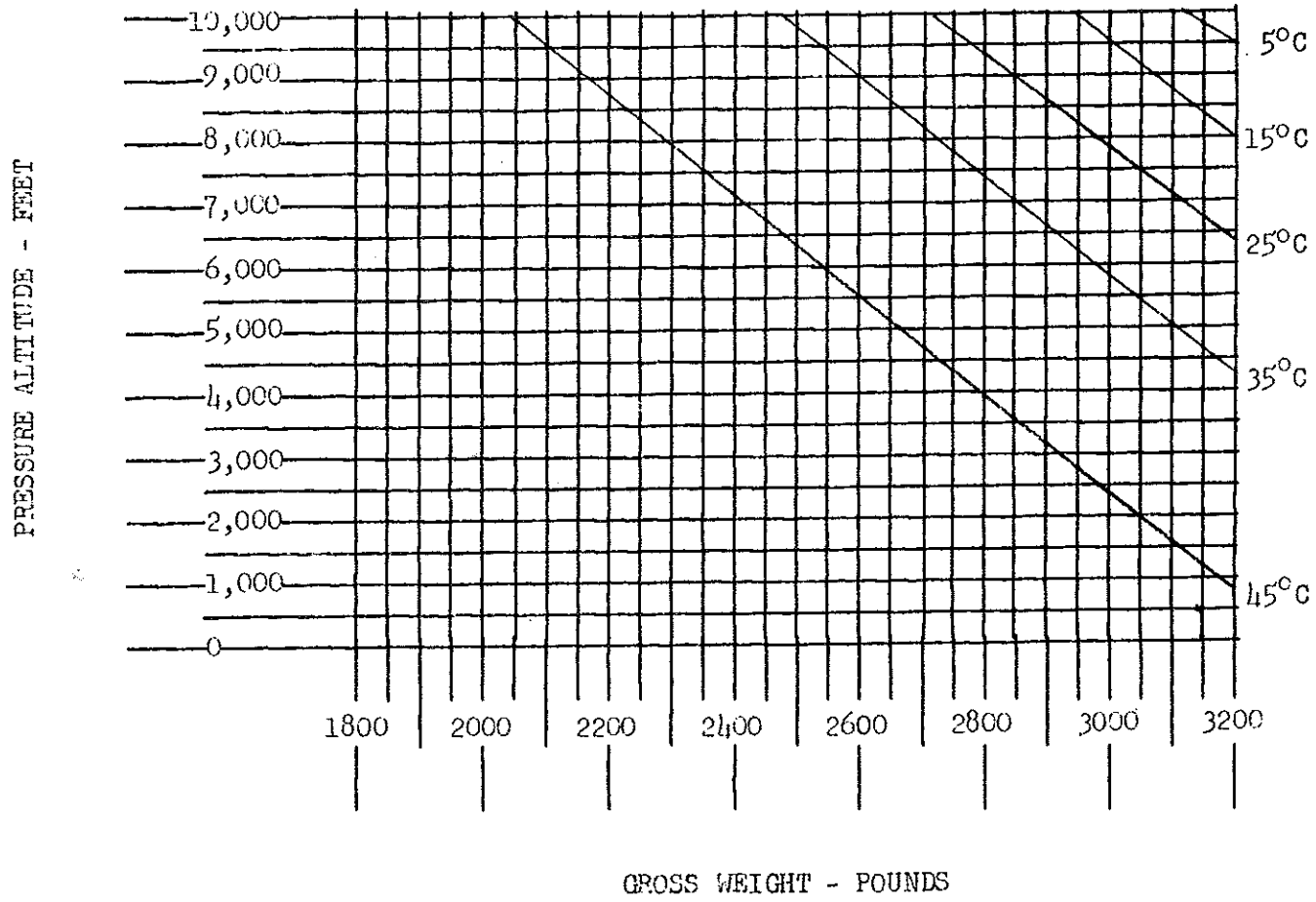
Spray booms are the most common applicator of liquid formulations used on helicopters (Figure 3). Boom width can vary from 4 to 50 feet. In spray boom application the chemical is normally stored in side-mounted tanks. The chemical is routed through a liquid pump that develops the required pressure. The extended booms have spray nozzles that contain a diaphragm, a washer-type orifice and a spinner. The diaphragm releases the liquid under pressure through the orifice, which controls column size, and the liquid column is then broken into various droplet sizes by the spinner before final exit.

In application of Fintrol-concentrate, it is essential to completely remove the orifice and spinner in each nozzle. By doing so, the toxicant is in effect being released as a one-eighth inch stream of liquid, as this is the inside diameter of the piping used. Air speed, wind velocity and water pressure dictate the actual particle size of the toxicant as it contacts the water surface. Under normal circumstances, water pressure is 20 to 30 p.s.i. and air speed should be approximately 45 m.p.h.

If the above conditions are met, experience has shown that antimycin reaches the water surface with a minimum of drift loss or carrier evaporation. A standard 10 percent toxicant loss is used in determining concentrations to be applied due to some inevitable misting caused by helicopter rotor motion and air speed.

The standard helicopter can normally carry 65 gallons of liquid. With a 65-gallon volume and 20 spray nozzles operating, an approximate strip 2,640 feet long by 50 feet wide can be treated in 3 minutes. This amounts to a surface area of 1.9 acres.

TABLE 1. Temperature and Pressure Altitude Affecting the Maximum Gross Weight of a Jet Turbine Bell Model 206 at or below 10,000 Feet



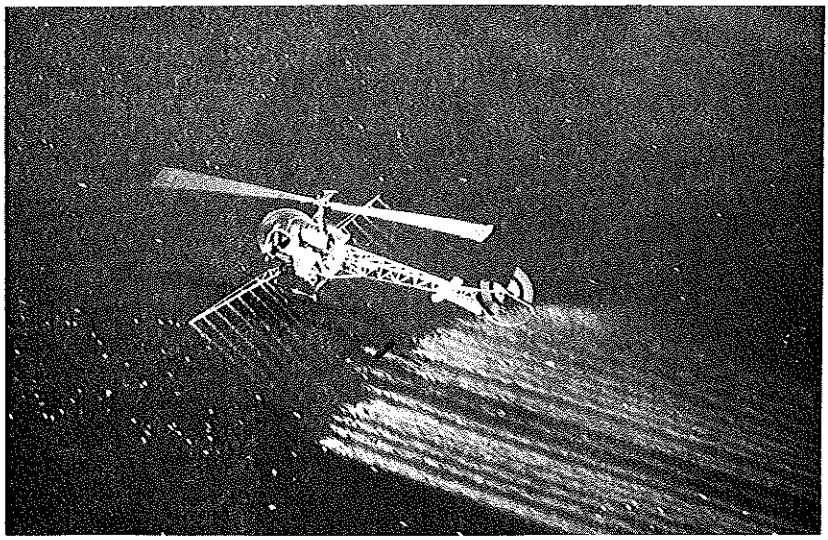


FIGURE 3

Helicopter with side-mounted tanks and spray booms applying liquid Antimycin.

There are two principal variables that will affect the delivery speed and capacity of a helicopter. They are:

1. size and horsepower of helicopter;
2. ferry time from heliport to target area.

The most critical variable is ferry time; many precious moments are lost if the heliport is not located as close as possible to the treatment area. Under the average situation a helicopter can be loaded, deliver the toxicant, and return in a 20-minute period of time.

If a large helicopter is used (such as the jet turbine Bell Model 206), loads can be doubled to 120 gallons and ferry time reduced due to increased speed capabilities. The rental fee for a jet turbine is normally $50 to $60 per hour higher than the standard gasoline helicopter which usually costs $100 to $110 per hour of spray time.

Habitat Types Requiring Aerial Application

Predictably in large chemical treatment programs a multitude of varying habitat types require aerial toxicant treatment. The four general categories below are those most frequently encountered.

1. Littoral areas less than three feet in depth.

   In nearly all situations like this Fintrol concentrate is used. Spray booms on helicopters is the vehicle of application and conditions as discussed under Aerial Equipment should be met. An arbitrary maximum depth of three feet is suggested, as it has been found that proper mixing may not occur in deeper water. It should be cautioned that even water as shallow as three feet may not mix properly if weather conditions are calm with no surface water agitation.

2. Intermittent streams with isolated pools or a heavy vegetative canopy.

   Streams or drainage ditches of this nature have long been the nemesis of project managers attempting a thorough, 100 percent treatment. Thick mats of floating duckweed, overhanging Reeds canary grass or other vegetation, often prevent penetration of the toxicant. By using a remote bucket adjusted to disperse a single jet of liquid (see Figure 4), the helicopter pilot can methodically and successfully treat such areas. The turbulence of the helicopter rotors normally part most vegetation and if possible the pilot hovers so that the remote bucket is just inches from the water surface.

3. Large, extensive ditches, ponds or lakes over three feet in depth.

   Waters of this nature will require granular Fintrol treatment. Either side-mounted tanks or the remote bucket can be used.

Figure 4. A remote liquid bucket adjusted to disperse a single jet of toxicant.

4. Numerous small ponds or pools over three feet in depth.

Most large watershed chemical treatment projects contain hundreds of privately managed ponds. Most of these harbor the target species and access is often a problem. To efficiently treat areas such as this with a minimum of manpower and time, the "hand dump" method of disbursing granules is ideal.

Summary

Use of liquid antimycin in fixed-wing aircraft has failed due to high air speeds and evaporation of the carrier as the toxicant was ejected. Helicopters have successfully applied antimycin because of their ability to reduce air speeds and variety of application equipment.

Antimycin can be applied in liquid and granular formulations. Equipment types that can be used on helicopters vary from a remote bucket that can deliver liquid or sand formulations to liquid spray booms. The remote bucket has the advantage of being able to apply liquid or sand granules with minor equipment changes. Spray booms with orifices and spinners removed can deliver a high volume of toxicant in a short period of time. The size and horsepower of the helicopter plus a short distance from heliport to the treatment area are critical factors in the efficiency of aerial application.

The versatility of the helicopter and the equipment it uses makes nearly any type of water habitat accessible. By using a remote bucket, spray booms, side-mounted tanks or a hand-dump technique, every possible refuge of the target fish can be treated in an efficient and economical manner.

LITERATURE CITED

Bell Helicopters

1972. Bell Jet Ranger II, Model 206 B Flight Manual. Fort Worth, Texas. 146 p.

Lennon, R. E., J. B. Hunn, R. A. Schnick and R. M. Burress

1970. Reclamation of ponds, lakes, and streams with fish toxicants: A review, FAO fisheries Technical Paper 100, Rome. 99p.

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